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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/603,924	06/24/2003	Shao-Chung Hu	JC-7109-CIP	4337
7590 03/16/2005				
WU & CHEUNG, LLP SUITE 710 7700 IRVINE CENTER DRIVE IRVINE, CA 92618-3043			EXAMINER NGUYEN, THANH T	
			ART UNIT 2813	PAPER NUMBER

DATE MAILED: 03/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/603,924	<b>Applicant(s)</b> HU ET AL.	
	<b>Examiner</b> Thanh T. Nguyen	<b>Art Unit</b> 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☐ Claim(s) 1-2, 4-7, 25-30, 31(21)- 36(26) is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-2, 4-7, 25-30, 31(21)- 36(26) is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____.  |

## **DETAILED ACTION**

### ***Priority***

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119

(a)-(d). The certified copy has been filed in parent Application No. 09/854,006, filed on 5/10/01.

### ***Oath/Declaration***

Oath/Declaration filed on 6/24/03 has been considered.

### ***Specification***

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Claim Objections***

The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 21-26 have been renumbered 31-36.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-7, 25-30, 31(21)- 36(26) are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirabayashi et al. (U.S. Patent No. 5,575,885) in view of Hsu (U.S. Patent No. 6,096,633).

Referring to figures 8a-12, Hirabayashi et al. teaches a method of removing contaminants from a silicon wafer after a chemical-mechanical polishing operation, comprising:

Providing a silicon wafer (21) having a layer (22/24/25) thereon;

Performing a polishing process to remove a portion of the wafer (24/25, see figure 8b-8c, 15b-15c, col. 9, lines 24-44); and

Treating the silicon wafer with a buffer-polishing process using an aqueous solution of ozone (see col. 12, lines 59-67).

Regarding to claims 2, 32(22), 26 wherein a concentration of ozone in the aqueous solution is between 100 ppm and 200 ppm (see col. 12, lines 59-60).

Regarding to claims 4, 34 (24), 28, treating the substrate is performed by a water-cleaning process (see col. 12, lines 59-67. Noted that ozone aqueous is ozone in water).

Regarding to claim 5, the layer is selected from the group consisting of a low dielectric constant material layer, metallic layer and a barrier layer (copper interconnect, see col. 12, lines 35-42).

Regarding to claim 6, the aqueous ozone solution is catalyzed to produce more free ozone radicals therein (see col. 14, lines 37-42. Noted that since aqueous ozone solution is known to catalyze by hydrogen peroxide. Therefore, it would produce more free ozone radicals).

Regarding to claim 7, the aqueous ozone solution is catalyzed by exposure to a beam or ultraviolet light or addition of hydrogen peroxide thereto (see col. 14, lines 37-42).

Regarding to claims 29, 31(21), providing an inertial mechanical force (dipping is hand pressure) so that contaminants on a surface of the substrate are removed (see col. 15, lines 37-67).

Regarding to claim 33(23), 27, buffer-polishing process (see col. 12, lines 59-67).

Regarding to claim 36(26), 30, forming a barrier layer (24/35) over the substrate (32/21), wherein the barrier layer is conformal to the surface profile of the substrate and cover the dielectric layer (33/22) before forming a metallic layer (36/25) process but after patterning the dielectric layer process (33), polishing the barrier layer to remove a portion of the barrier layer and expose the dielectric layer after performing polishing step (see figures 13a-13c and 15a-15c).

However, Hirabayashi et al. does not teach polishing the layer by using chemical-mechanical polishing as cited in claims 1, 25, 31(21), and the mechanical force in the cleaning step. Nevertheless, polishing the metal layer by using chemical-mechanical polishing, and the mechanical force in the cleaning step is known in the semiconductor processing art as evidenced by Hsu.

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Hsu teaches polishing the metal layer by using chemical-mechanical polishing or etch back (see col. 3, lines 25-30).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would polish the layer by using chemical-mechanical polishing technique in process of Hirabayashi et al. in process of Hsu because chemical-mechanical polishing would provide a metal with planar surface.

The mechanical force in the cleaning step is considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. As noted in *In re Aller*, the selection of reaction parameters such as temperature and concentration would have been obvious:

Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed Acritical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

*In re Aller* 105 USPQ233, 255 (CCPA 1955). See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmscher* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sola* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934).

Therefore, one of ordinary skill in the requisite art at the time the invention was made would have used any mechanical force in the cleaning step suitable to the method in process of Hirabayashi et al. in order to optimize the process.

### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-2, 4-7, 25-30, 31(21)- 36(26) are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-8 of U.S. Patent No. 6,696,361. Although the conflicting claims are not identical, they are not patentably distinct from each other because both the present invention and the patent application claim a substrate (wafer) having dielectric layer, barrier layer, metal layer, CMP to remove a portion of the wafer, treating the wafer with a buffer-polishing process using an aqueous solution of ozone.

### ***Conclusion***

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr., can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).



Thanh Nguyen  
Patent Examiner  
Patent Examining Group 2800

TTN